

PSYCHE.

SOME PSOCINA OF THE UNITED STATES.

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(Concluded from p. 210.)

3. *Pterostigma-hook*. This curious feature has until now been entirely overlooked. It is mostly "the small black or dark spot at the basis of the pterostigma" mentioned in the description of the species. Apparently low magnifying powers have always been used in the study of *Psocus*. The subcosta of the fore wings always goes to the mediana, except in *Amphientomum* and related genera, *Perientomum*, *Syllisis*, *Calopsocus* and other exotic forms, where the subcosta joins the costa. Sometimes the subcosta ends abruptly, without joining one of the two adjacent veins. Whether this vein is analogous to the subcosta, as McLachlan contends, or whether it is only a branch of the subcosta similar to that in *Calotermes* and other insects, is still a point of dispute. * I never saw it accompanied by a trachea, nor, as far as my observation goes, have I seen a trachea accompanying the costa from the base of the wing to the pterostigma.

The mediana is accompanied by a very strong trachea from the base to the pterostigma. This trachea is not contained in the vein, but runs very near it, below, sometimes indeed separated from it a little, so that two veins seem to be present here. At the beginning of the pterostigma the trachea has a spindle-shaped, more or less long dilatation, a tracheal bladder, with visible but more

separated spiral threads. This dilatation lies below a small sac or better a hernia of the mediana, before it enters the large sac or blood sinus represented by the pterostigma. This hernia is not developed in the wing of the nymph, but just after transformation it is found, as well as the pterostigma, crowded with blood cells. The hernia is found, sometimes very visible, in most of the genera, except in a few aberrant groups such as *Amphientomum* and its relations, *Empheria* and perhaps others. There the spindle-shaped tracheal bladder is present, but simply follows the end of the mediana to the costa. Where the hernia is present, it lies on the under side of the wing, where the mediana enters the costa, and forms together with it the pterostigma. Probably the stronger current in the costa somewhat opposing the current of the mediana is the reason of the formation of the hernia, to overcome the pressure of the current in the mediana. As everywhere in insects where strong currents occur, accompanied by strong tracheae, we find here the tendency to a more prominent chitinization. Therefore the hernia shows very different forms, a ball, a circular or bottle-shaped inflation or a more or less chitinous and dark-colored often sharp hook, as in *Caecilius*, *Peripsocus* and others. In *Psocus* (proper) it has mostly the shape

of a fleshy cone. An interesting feature of this arrangement is that the trachea seems in *Psocus* (proper) to enter the pterostigma-sac after the spindle-shaped bladder. We find sometimes that the end of the trachea does not follow strictly the lower and the external margin of the pterostigma, and such occurrences are marked in the description, the "pterostigma somewhat exceeds the vein below and externally," whereas it exceeds not the vein but only the trachea.

4. *The lock of the fore-wings.*

It is well known that lepidoptera, hymenoptera, orthoptera, and *phryganina* possess an arrangement on the hind margin of the fore wings to clasp the front margin of the hind wings during flight. Thus both wings work exactly together as if there was only one wing on each side. This arrangement—which I call the lock—is of very different shape and form, and is nowhere mentioned as existing in the family of *psocina*. As far as my observations go, it is to be found in every four-winged genus, just where the anal vein is united to the hind margin. Descriptions of the species remark frequently a dark or black spot in this place, which spot covers the lock. The parts are here, as they are in the pterostigma-hook, more strongly chitinous, and as everywhere, in consequence of stronger action impending upon those parts, darker colored. The anal vein is an exception, compared with other veins, because it is not accompanied by any blood vessel; at least I have not been able to discover one even in the newly transformed imago. Furthermore the anal vein has always an aspect different from all others; it looks clear and as if

something present on the other veins was wanting here. But there is another remarkable difference. As said before, all the other veins form a double net of tracheae, one belonging to the upper membrane of the wing, the other to the under membrane; both exactly covering one another, and their veins forming a loop at the hind border of the wing. Now the anal vein belongs strictly to the under side of the wing, and, as it seems, only the branch belonging to the under membrane is developed, and this is provided with a spiral thread much stronger than in the other veins and passing on each side considerably beyond the trachea, which has therefore more or less dentated margins. The anal vein of the upper membrane can not be entirely wanting, and I was able to observe that it forms a very small, perfectly hyaline vessel without any indication of a spiral thread, and that the trachea of the under membrane disembogues as a recurrent vessel in the axillary vein. The anal vein originates at the base of the wing from a large trachea passing through the posterior callus, and connects, beyond the basal articulation of the wing, with the trachea of the submediana and with those of the mediana through a strong loop. A straight, chitinous rod also connects the anal vein directly with the base of the median vein. By this ingenious arrangement the anal vein can be compared to a shroud, which strengthens the wing and principally the point where both wings are to be connected during flight, by bringing them into dependence upon the stronger muscles which move the principal veins originating from the anterior callus of the wing.

It is easily understood why only the anal vein of the under membrane is strongly developed. This alone has to work in keeping the hind wing in place. As the two membranes of the wing are very loosely connected one to the other, it is an apparent advantage that just the working vein is more strengthened at the expense of its not-working partner. The lock becomes even stronger by the connection of the axillary vein at the same place on the hind margin. In *Ps. venosus* the diameter of the anal vein is about 0.176 mm., and the side projection of the spiral thread about 0.039 mm.

Where the anal vein connects with the axillary vein, which is more chitinized at its end, there is a strong yellow chitinous hook, its opening about 0.333 mm. looking to the tip of the wing. At first the hook looks as if it was only the prolongation of the spiral threads, as it consists of numerous fine threads in near juxtaposition; its tip is bent, flat and transversely cut. But a closer examination shows that the hook originates, with numerous roots, from the upper margin of the axillary vein, and one stronger, straight root from the inferior margin. A transverse row of four small, horny teeth in crescent shape is placed just opposite the opening of the hook on the end of the axillary vein. It is well understood that the anterior margin of the hind wing, caught in the hook, and assisted by these teeth, will be held firmly in position. But to facilitate the catch the margin of the fore wing just opposite to the hook is bent downward, and allows the margin of the hind wing to slide in an easy manner in the hook. To make things stronger and more

efficient, the point by which the hind wing is caught in the hook is just where the interior ramus (Kölbe) of the median vein originates, and I have reason to believe that not only the front margin of the hind wing, but also the median vein, is placed in the hook. At least several specimens of *Psocus* in amber show such a position.

The lock is about the same in *Psocus nebulosus* and related species. *Ps. affinis*, in amber, has numerous transverse impressions above the end of the axillary vein, forming a row of teeth to take hold of the hind wing. *Cacilius* and *Epi-psocus* possess a hook similar to *Psocus*, but more pointed; *Amphientomum* has the end of the axillary vein bent up, and a tubercle on the anal vein. Probably there will be a difference in the lock of other *psocina*.

5. Mouth-parts.

The mouth-parts of *Psocus* were described in a satisfactory manner generally by Latreille nearly a century ago. The valuable details given recently, chiefly concerning the maxilla, have not mentioned the most interesting fact, that the inner lobe (fork, Burgess) slides in the outer lobe as in a vagina. The fact is easily ascertained in living specimens, and, if the preparations are not compressed so much as to separate the parts, in alcoholic specimens. Latreille says: "altera (parte mandibulae) externa membranacea, vaginam constituens cylindrico compressam, obtusam, apice pervio." It should be acknowledged that the figures published by Latreille are very faulty, and correspond in no way with the description. Fabricius has described the parts "maxilla cornea.

elongata, linearis, apice bicrenata in vagina membranacea obtusa latens." The description given by Latreille in his *Genera Crustaceorum et Insectorum* is even more complete than his previous one. The ligament of the fork is attached to the stipes and is its ligament of articulation, allowing the fork to be pushed forwards; the fine membrane attached to the middle of the fork unites with the membrane of the fleshy basal part of the maxilla, permitting the fork to slide backwards and forwards through the fleshy part of the maxilla by means of a cone of muscles, just like the ovipositor in microlepidoptera. The relaxation of those muscles brings the fork and the ovipositor back, without—as far as my observations go—any help from retractor muscles. The tip of the fork slides in a horny ring of the tip of the outer lobe, which is easily broken by preparation or compression. Therefore the arrangement is similar to the arrangement in the hemiptera. Nevertheless, I confess that I know no other insect, in which the inner lobe passes through the base of the outer one and is held in position by an apical annulus. The formation of the latter can be thought to be produced by lateral teeth growing out from the outer lobe and finally surrounding the inner lobe. But it is wonderful that just this most remarkable feature, described about a century ago, and easily to be ascertained in living specimens, has been overlooked by all following observers.

Genus AMPHIIGERONTIA.

Mr. Kolbe has separated four European species from the genus *Psocus*

to form a new genus *Amphiigerontia*. But the genus cannot stand by the characters assigned to it. The last two species have the rami venae medianae interni and submedianae externi connected in one point, the two other species have it not. The North American species have those rami either connected in a point, or not. There are specimens in which the rami are partly united as in *Psocus* (proper), and other specimens in which the ramuli venae medianae interni are divergent as in *Psocus* (proper).

1. *Psocus variegatus* Latr.

I have before me 24 specimens of both sexes from Europe, all from Germany. They live on linden and chestnut; the female appears sometimes in swarms. All my specimens show longitudinal stripes, sometimes black ones, on the front, the existence of which is denied by M'Lachlan and Kolbe. The yellow color of the pterostigma is sometimes wanting. One male from Gilgenau, Eastern Prussia, has larger orbicular eyes than the others, the space between the eyes being smaller than the diameter of the eyes. All the other males have this space larger. The legs are often so dark, that they might better be called brown. One specimen with rudimentary, smoky wings and a rudimentary venation is not a nympha (the ocelli present), but belongs to the so-called *Lachesilla* form. (M'Lachlan says *Lachesis* Westw., *Lachesilla* Hagen, but he has overlooked that *Lachesilla* is Westwood's name; cf. Generic Synopsis, Introduction, p. 47, 158.) I am not able to separate two males from Berlin Fells, N. Y., and from Dalton, Georgia, from the European species. The details are given

under *Psocus moestus*.

2. *Psocus moestus* Hag., Syn. N. Am. Neur., p. 11, no: 8.—5 specimens, male and female, Mass., August. Size, color and pattern as in *Psocus variegatus*, but differs as follows:

Vertex strongly spotted with black; front almost black, with dark longitudinal stripes; antennae darker, the second basal joint with a yellow apical ring; legs brown, lighter rings around the base of the femur and on the knee; tibia darker on tip, first tarsal joint yellow. Wings darker; pterostigma without yellow; all veins and the marginal vein around the wing with alternate dark and white dots, both alike in size; a pale band, parallel to the apical margin but a little distant, runs later obliquely to the hind margin, and is finally bent upward; the part of the membrane encircled by this band is spotted as the rest but with paler brown spots; the apical half of the front margin of the hind wings has alternating dark and white dots. The middle cell is as in *Psocus* quinquangular, sometimes quadrangular.

The two males mentioned under *Psocus variegatus* do not possess the alternating dots on the margin, nor on the veins, nor on the hind wings; the femur has no pale ring on the knee, the first tarsal joint is brown; the antennae are not so dark; the pterostigma is yellow.

Three other specimens, male and female, from New England, probably from the White Mountains, are visibly larger. They look very different, and I believed them to be a new species. The wings are less dark, the pale band and the encircled part are paler and more strongly

marked, forming three brown festoons on the tip of the wing; antennae paler; legs as in *Psocus moestus*, but paler; discoidal cell quadrangular. I believe they had better be left with *Psocus moestus* till other characters are known.

3. *Psocus lichenatus* Walsh, Proc. Ent. Soc. Phil., 1863, p. 188.

I possess only two types, male and female, from Rock Island, Ill.

This species is nearly related to *Psocus variegatus*, but smaller, 3-3½ mm.; the discoidal cell somewhat quinquangular. Head yellow, less spotted with black; front yellow, with black stripes formed by a series of black dots. Antennae shorter than the wings, thicker, pilose; basal joints yellow, dark at the base; the other joints black; but on the first joints the basal half white, on the following a white basal ring. Thorax brown, all junctures yellow. Legs yellow; femur and tibia spotted with black; first joint of tarsus yellow, second one brown. Front wings brown, with three pale, not spotted fields: a large one in the middle, beginning in the upper angle of the discoidal cell and dilated triangularly towards the hind margin; the two other ones on the tip of the wing, separated above and below by a brown band; veins brown; paler yellow elongated spots near the veins, but not upon them; pterostigma brown, inner angle black; three black elongated dots in the costal space near the pterostigma; hind wings hyaline, front margin not spotted. The species appears in swarms in fall on sandstone cliffs.

I know of no other North American species belonging to *Amphigerontia*.